

REMARKS

In view of the above amendments and the following remarks, reconsideration of the rejections and objections, and further examination are requested.

Claims 1-46 were pending in this application. Claims 4, 6-12, 18-21, 28-32, 34, 35, 37, 39, 41, 42, 44 and 46 have been withdrawn from consideration. Claims 1-3, 5, 13-15, 22-26, 33, 36, 38, 40, 43 and 45 stand rejected. Claims 16 and 17 have been objected to and have not been further treated on the merits. Claims 1-26, 28, 31 and 33-46 are amended herein, and claims 47-52 are added herein. No new matter has been added.

It is noted that the Examiner has not rejected claim 27 over the prior art. Thus, Applicants respectfully submit that claim 27 is allowable over the prior art of record.

The specification and abstract have been carefully reviewed and revised to make grammatical and idiomatic improvements in order to aid the Examiner in further consideration of the application. Amendments to the specification are contained herein. Moreover, a substitute Abstract including revisions has been prepared and is submitted herewith. Also submitted herewith is a marked-up copy of the Abstract indicating the changes incorporated therein. No new matter has been added.

Claims 16 and 17 are objected to under 37 CFR § 1.75(c) as being in improper form because a multiple dependent claim cannot depend from another multiple dependent claim. In response, claims 16 and 17 have been amended to each depend from claim 13.

Accordingly, the Applicants respectfully request that the 37 CFR § 1.75(c) objection to claims 16 and 17 be withdrawn.

Claims 40, 43 and 45 have been rejected under 35 U.S.C. § 101 because the Examiner asserted that the claimed inventions are directed towards non-statutory subject matter. Claims 40, 43 and 45 have been amended to recite statutory subject matter.

Accordingly, the Applicants respectfully request that the 35 U.S.C. § 101 rejection of claims 40, 43 and 45 be withdrawn.

Claims 1-3, 33 and 40 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Sharma et al. (U.S. Patent No. 6,192,079) (hereinafter referred to as "Sharma"). Claims 13-15, 36 and 43 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Ishii (U.S. Patent No. 5,204,740) (hereinafter referred to as "Ishii"). Claim 5 has been rejected under 35 U.S.C. § 103(a) as

being unpatentable over Sharma in view of Ishii. Claims 22-26, 38 and 45 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Sharma in view of Demos (U.S. Patent Application Publication No. 2004/ 0005004) (hereinafter referred to as “Demos”).

Independent claims 1-3, 13, 22, 33, 36, 38, 40, 43 and 45 have been amended to distinguish over the references cited by the Examiner. Support for the amendments can be found in the specification on page 47, line 19 to page 48, line 30.

The above rejections are submitted to be inapplicable to the amended claims for the following reasons.

Claim 1 requires an interpolation frame generation device including, in part, an interpolation frame generation unit operable to generate an interpolation frame for an image block that is not included in one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally further from the interpolation frame than the one image frame.

Sharma discloses video frame interpolation in video decoding processes. Specifically, Sharma discloses a technique for interpolation that uses both forward and backward motion estimation. In forward motion estimation, each block in the current decoded frame is assigned a motion vector by finding the best matching block in the previous decode frame. The best matching block is determined using the sum of absolute differences (SAD) between pixel values as an error measure. The block in the previous frame with the smallest SAD is chosen as the best matching block. In backward motion estimation, each block in the previous decoded frame is assigned a motion vector by finding the best matching block in the current decoded frame. When constructing an interpolated frame, at each pixel either the forward or backward motion vector is selected, depending on which of the two estimates yield the minimum SAD. The interpolation is performed using the selected motion vectors and by applying a spatio-temporal median filter. (Col. 7, lines 1-25).

In contrast to the present invention, Sharma does not disclose using a frame other than the current decoded frame and the previously decoded frame. Instead, Sharma discloses using the current decoded frame and the previously decoded frame to determine an interpolated frame. Moreover, there is no suggestion or disclosure in Sharma to use a frame other than the current decoded frame and the previously decoded frame. In other words, Sharma does not disclose an

interpolation frame generation device including, in part, an interpolation frame generation unit operable to generate an interpolation frame for an image block that is not included in one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally further from the interpolation frame than the one image frame.

For at least the reasons discussed above, it is believed clear that Sharma fails to disclose or suggest the present invention as recited in claim 1.

Regarding the combination of Sharma and Ishii, Ishii is relied upon in the rejection as teaching indicating decision means receiving the block characteristic information and a coded information signal on the block basis and based on the received information decides if the image signals can be decoded or not.

Ishii discloses an image signal decoding apparatus for decoding digital image signals. An interpolation decision circuit 24 decides an interpolation method by estimating the presence/absence of an image motion in a deficient block in accordance with image motion information on a nearby data block. An adaptive interpolation circuit 26 carries out inter-frame interpolation for a block belonging to a still image area, and intra-frame interpolation for a block belonging to a moving image area, respectively, in accordance with a decision given by the interpolation decision circuit 24. (Col. 3, lines 20-35). The adaptive interpolation circuit 26 generates interpolation data by using decoded image data stored in the frame memory 28, and stores the interpolation data in the frame memory 28. Since the image data of one frame before are stored in the frame memory 28 at the position corresponding to the block without data deficiency, the inter-frame interpolation can be realized by inhibiting the data from being updated by the adaptive interpolation circuit 26. For the intra-frame interpolation, all the image data of a block with data deficiency are interpolated by using image data of a block near the block with data deficiency among those blocks which can be decoded. (Col. 4, lines 20-35).

Notably, Ishii does not disclose using a frame other than one frame before. Instead, Ishii discloses using image data of one frame before. Moreover, Ishii does not suggest or disclose using a frame other than one frame before. In other words, Ishii does not disclose an interpolation frame generation device including, in part, an interpolation frame generation unit operable to generate an interpolation frame for an image block that is not included in one image

frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally further from the interpolation frame than the one image frame. Thus, it is clear that Ishii also fails to disclose or suggest the above-discussed features of the interpolation frame generating device recited in claim 1.

Regarding the combination of Sharma and Demos, Demos is relied upon in the rejection as teaching the use of a plurality of image frames that are located either before or after the interpolation frame in the display order. Demos discloses a sequence of P and B frames in which a subsequent P frame has multiple motion vectors referencing prior P frames. A B frame 1400 references a subsequent P frame P3. This P3 frame in turn has two motion vectors, mv1 and mv2, that reference corresponding prior P frames P2, P1. Each macroblock of the B frame 1400 can be interpolated in direct mode using either of two weighting terms or a combination of such weighting terms. Thus, it is clear that Demos also fails to disclose or suggest the above-discussed features of the interpolation frame generating device recited in claim 1.

Regarding claims 2, 3, 13, 22, 33, 36, 38, 40, 43 and 45, they are patentable over the references relied upon in the rejections for reasons similar to those set forth above in support of claim 1. That is, each of claims 2, 3, 13, 22, 33, 36, 38, 40, 43 and 45 similarly include an interpolation frame generation device including, in part, an interpolation frame generation unit operable to generate an interpolation frame for an image block that is not included in one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally further from the interpolation frame than the one image frame.

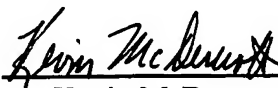
Because of the above-mentioned distinctions, it is believed clear that claims 1-3, 13, 22, 33, 36, 38, 40, 43 and 45 are patentable over the references relied upon in the rejections. Further, it is submitted that there is no reason in the prior art of record that would have caused an ordinary artisan to modify the applied art in such a manner as to result in, or otherwise render obvious, the invention of claims 1-3, 13, 22, 33, 36, 38, 40, 43 and 45. Therefore, it is respectively submitted that claim 1 and claims 47 and 48 depending therefrom, claim 2 and claims 49 and 50 depending therefrom, claim 3 and claim 5 depending therefrom, claim 13 and claims 14-17 depending therefrom, claim 22 and claims 23-27, 51 and 52 depending therefrom, and claims 33, 36, 38, 40, 43 and 45 are clearly allowable over the prior art of record.

In view of the foregoing amendments and remarks, all of the claims now active in this application are believed to be in condition for allowance. Reconsideration and favorable action are respectfully solicited.

Should the Examiner believe there are any remaining issues that must be resolved before this application can be passed to issue, it is respectfully requested that the Examiner contact the undersigned by telephone in order to resolve such issues.

Respectfully submitted,

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